

CALIFORNIA DEPARTMENT OF TRANSPORTATION



**Independent Assurance Program
Annual Report
Calendar Year 2010**

**Division of Engineering Services
Materials Engineering and Testing Services
Transportation Laboratory
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California Department of Transportation Independent Assurance Program Annual Report Calendar Year 2010

1. OVERVIEW

1.1. INTRODUCTION

Title 23 of the *Code of Federal Regulations*, Chapter I, Part 637, Subpart B, Section 637.205(a) (23CFR637.205(a)), the Federal Highway Administration's (FHWA's) quality assurance procedures for construction require the following:

Each STD [state transportation department] shall develop a quality assurance program which will assure that the materials and workmanship incorporated into each Federal-aid highway construction project on the NHS [National Highway System] are in conformity with the requirements of the approved plans and specifications, including approved changes.

Key components of this quality assurance program are “acceptance” and “independent assurance.” Independent Assurance (IA) programs may be project or system-based. The California Department of Transportation (Caltrans) has chosen to implement a system-based IA program.

Agencies choosing to implement a system-based IA Program are required by 23CFR637.207(a)(2)(iv) to submit an annual report. In fulfillment of this requirement, this report is being submitted concerning activities of the Caltrans IA Program for calendar year 2010.

1.2. ANNUAL REPORT OVERVIEW

The Caltrans Independent Assurance (IA) Program provides a framework for ensuring that the quality assurance program, as outlined in the Caltrans *Construction Manual* and in project specifications, is supported by qualified technicians and accredited laboratories. The Caltrans IA Program provides periodic evaluation of the performance of sampling and testing personnel, testing equipment, and testing laboratories.

The purpose of this document is to provide:

- A discussion of IA activities from January through December 2010
- A discussion of the current IA Program
- Information on the Reference Sample Program (RSP)

1.3. SUMMARY OF ACTIVITIES: CALENDAR YEAR 2010

- **New IA Staff Certification** – Materials Engineering and Testing Services (METS) IA staff certified 1 new district IA staff.
- **District IA Staff Recertification** – METS IA staff recertified 34 district IA and local assistance IA staff.
- **The 2010 Annual IA Meeting** - The 2010 Annual IA Meeting was held on December 9 and 10, 2010. Issues such as equipment calibration and district IA concerns were discussed.
- **District Process Reviews** - METS IA staff conducted district IA process reviews in the 12 districts.
- **Technician Qualification** – Materials Engineering and Testing Services (METS) IA staff, district IA and local assistance staff qualified a total of 2583 technicians in Caltrans, local agencies and commercial laboratories.
- **Laboratory Accreditation** - METS IA staff, district IA staff and local assistance IA staff accredited a total of 429 Caltrans, local agency and commercial laboratories.
- **Equipment Calibration by METS IA Staff** – METS IA staff calibrated large equipment in 13 Caltrans and 16 local agency testing laboratories.
- **Reference Sample Program (RSP)** - The Reference Sample Program sent out proficiency samples to participating laboratories in aggregate and asphalt concrete.

2. CALTRANS INDEPENDENT ASSURANCE (IA) PROGRAM

2.1. BACKGROUND

Since 1992, Caltrans has been committed to an IA program. Guidance for the program is outlined in the *Caltrans Independent Assurance Manual*, which can be located at the following website address:

<<http://www.dot.ca.gov/hq/esc/Translab/ofpm/IAP.htm>>

In 1994, Caltrans shifted from a project-based process for reviewing technicians, equipment, and results to a system-based process. In the system-based process, a technician's qualifications are ascertained by written examinations, witnessed performance of tests, and results of testing on split samples of materials for corroboration of test results. Caltrans IA staff reviews equipment and laboratories annually; and laboratories participate in a statewide proficiency sampling program. 23CFR637.207(a) provides that this approach removes the necessity of project-specific samples.

Caltrans views independent assurance as an important and integral part of its quality assurance program, but separate from individual project quality assurance efforts. Independent assurance is implemented by METS. The Division of Construction ensures individual project quality assurance. Quality assurance at the project level is outlined in the *Construction Manual*, which is located at the following website address:

<<http://www.dot.ca.gov/hq/construc/manual2001/>>

In keeping with the requirements of the IA Program and 23CFR637, Section 6-102C(2) of the *Construction Manual* instructs the construction engineer that:

All acceptance testers require certification. No tests or samples are to be taken on Caltrans projects unless the tester is certified in the test being performed.

District	Certified IA Staff			Number of Qualified Technicians			Accredited Laboratories											
							Caltrans			Local Agencies			Private Industry			Total		
	2010	2009	2008	2010	2009	2008	2010	2009	2008	2010	2009	2008	2010	2009	2008			
1	3	2	2	106	120	66	11	14	11	2	1	2	4	4	0			
2	4	3	3	124	145	155	9	8	8	1	1	1	9	7	9			
3	3	3	3	248	261	124	17	17	13	0	0	2	16	22	25			
4	4	3	5	352	501	558	6	10	32	0	0	3	36	30	7			
5	1	1	1	173	150	139	11	10	10	2	2	2	20	21	13			
6	1	2	2	202	219	239	6	6	5	3	3	2	26	23	25			
7	4	4	4	239	211	217	16	8	1	0	0	0	19	19	15			
8	2	2	3	305	394	417	6	6	5	1	2	2	33	39	37			
9	1	1	2	32	46	45	2	3	2	0	0	0	6	7	4			
10	2	2	2	193	187	176	5	6	3	0	0	0	17	20	15			
11	2	2	2	146	269	150	26	23	14	2	2	2	30	32	20			
12	2	2	2	196	252	225	4	4	4	1	1	1	25	22	20			
Total of all Districts	29	27	31	2316	2755	2511	119	115	108	12	12	17	241	246	190			
Total For HQ IA	1	1	1	25	0	47	2	6	7	0	0	0	0	0	0			
Total for Local Assistance IA	5	5	0	242	91	0	0	0	0	17	8	8	38	7	0			
Total for Districts and Headquarters	35	33	32	2583	2846	2558	121	121	115	29	20	25	279	253	190			

TABLE 1: IA PROGRAM DATA FOR 2010

3. CALTRANS IA PROGRAM IN 2010

Shown in Table 1 is a summary of certified Caltrans IA staff, qualified technicians, and accredited laboratories for 2010.

3.1. INDEPENDENT ASSURANCE STAFF CERTIFICATION

In 2010, one new district IA staff person was certified to replace IA staff in Districts 6.

3.2. ANNUAL RECERTIFICATION OF STATEWIDE IA STAFF

METS IA staff audited the districts to recertify staff. METS IA staff recertified 29 district IA staff in all districts. IA staff reviewed CT 216, “Relative Compaction of Untreated and Treated Soils and Aggregates”, as a result of findings from the 2010 RSP.

3.3. 2010 INDEPENDENT ASSURANCE ANNUAL MEETING

The IA Annual Meeting was held in December 2010. FHWA, METS, district IA staff, local assistance IA staff and District Materials Engineers were in attendance. Attendance by district IA staff is mandatory for IA recertification. District IA staff that do not attend are required to attend a make-up session.

The following topics were covered:

- Overview of IA program in 2010
- Equipment calibration
- 2010 Reference Sample Program
- Status of test method changes
- District IA issues

3.4. DISTRICT IA PROCESS REVIEW

The *Independent Assurance Manual* requires an annual process/peer review to verify district compliance with Caltrans policies regarding independent assurance. The review consists of an examination of IA documents, records and procedures. METS IA staff conducts the review of the district IA program implementation. These reviews are intended to promote statewide uniformity in the Caltrans IA Program.

Districts were reviewed by METS IA staff in 2010. In general, all districts have improved their file systems. METS IA staff will continue to conduct process reviews in 2011.

3.5. TECHNICIAN QUALIFICATION

District IA staff, METS IA staff and local assistance IA staff qualified a total of 2583 technicians in 2010. This is a decrease from the 2846 technicians accredited in 2009.

3.5.1 TECHNICIAN DISQUALIFICATIONS

Seven technicians were disqualified by district IA staff due to use of improper test procedures. In these cases, no dispute resolution was requested.

3.6 WRITTEN EXAM AND PRACTICAL STATISTICS

The 2010 data provided for the written exams and practical exams is shown in Table 2.

TABLE 2: 2010 EXAM STATISTICS												
DIST.	INITIAL WRITTEN EXAM FOR QUALIFICATION				INITIAL PRACTICAL EXAM FOR QUALIFICATION				WITNESS OR CORROBORATION TEST FOR REQUALIFICATION			
	# OF TOTAL EXAMS	# FAIL 1ST TIME	# FAIL 2ND TIME	# FAIL 3RD TIME	TOTAL EXAMS	# FAIL 1ST TIME	# FAIL 2ND TIME	# FAIL 3RD TIME	TOTAL EXAMS	# FAIL 1ST TIME	# FAIL 2ND TIME	# FAIL 3RD TIME
1	368	73	8	0	253	9	1	0	911	12	0	0
2	480	65	19	13	442	24	8	6	1082	13	0	0
3	729	172	21	4	338	4	0	0	1353	0	0	0
NR SR	189	15	0	0	24	10	0	0	59	5	2	1
4	801	58	2	0	775	55	0	0	1001	26	3	0
5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6	1386	337	24	4	1211	96	6	0	645	6	0	0
7	661	103	14	3	395	7	1	0	2158	9	0	0
8	894	144	24	4	416	8	0	0	1954	2	1	0
9	298	38	4	0	272	4	0	0	115	0	0	0
10	503	54	13	1	381	21	2	0	1209	21	0	0
11	947	204	54	4	220	15	0	0	807	0	0	0
12	450	94	2	0	248	4	3	0	687	3	0	0
METS IA	58	10	0	0	24	0	0	0	34	0	0	0
LIA 1,2,3	295	53	2	0	214	17	3	0	34	83	1	0
LIA 4,CR	492	55	8	0	417	12	1	0	301	7	0	0
LIA 6, SR	172	22	4	0	155	4	0	0	332	0	0	0
LIA 11,12	104	23	2	0	24	3	0	0	9	0	0	0

Note: NR SR – Northern Region Structures staff covering District 1, 2 and 3
LIA 1,2,3 – Local Assistance IA staff covering District 1, 2 and 3
LIA 4, CR – Local Assistance IA staff covering District 4 and Central Region
LIA 6, SR – Local Assistance IA staff covering southern District 6, 7, 8 and 9

As shown in the data, the major hurdle in the technician qualification process is passing the written exam and first practical exam.

3.6.1 PRACTICAL EXAMS FOR TECHNICIAN QUALIFICATION

In analyzing the data for the practical exams, the failure rate is lower.

Failure to pass the practical examination will occur if improper test equipment is presented, if an uncorrected error in proper test procedure occurs while demonstrating the test procedure, or if the technician fails to complete the paperwork or calculations correctly.

Witness or corroboration testing occurs when a technician is renewing their qualifications for a test method. In general, the failure rate is low which indicates that once a tester has been qualified for a test method they easily pass the annual requalification process.

3.7 LABORATORY ACCREDITATION

In 2010, METS IA, district IA staff and local assistance IA staff accredited a total of 429 Caltrans, local agency and commercials laboratories. This is an increase from the 394 laboratories accredited in 2009.

3.7.1 LABORATORY ACCREDITATION, REVOCATION AND DISPUTE RESOLUTION

Section 2.5, “Dispute Resolution” of the *Caltrans Independent Assurance Manual* states:

“A tester or laboratory may have its entire qualification or accreditation or its qualification or accreditation for specific test methods suspended or revoked if it is found not to conform to IA accreditation requirements.”

In 2010, one laboratory had its accreditation suspended due to lack of RSP participation. Once the laboratory began to participate in the RSP, the laboratory accreditation was reinstated.

3.8 CALTRANS LABORATORIES— EQUIPMENT AND CALIBRATION

Since 2002, METS has been instrumental in providing funding for testing equipment for the District Laboratories and Construction field laboratories throughout the state. Funding was provided by METS to the districts again in 2010 to purchase laboratory equipment and to provide required installation/calibration for the new equipment.

3.8.1 PROPER CALIBRATION OF TESTING EQUIPMENT

METS IA staff calibrate all large testing equipment in the district laboratories. In addition, METS IA staff performs calibration of presses and compactors for Caltrans and local agencies on an annual basis. This ensures that all Caltrans’ local agency large testing equipment is being calibrated uniformly.

In 2010, METS IA staff calibrated large equipment in 13 Caltrans and 16 local agency laboratories.

For smaller equipment, local IA staff is responsible for verifying the calibration of all testing equipment in accredited field laboratories. Some districts' IA staff is responsible for calibration of equipment in the district and field laboratories. While other districts' IA review the calibration records for district and field laboratories from private calibration services. Overall, all calibration records are reviewed by district IA staff, whether they are directly responsible for calibration of the equipment or not. The *Independent Assurance Manual* covers calibration procedures for equipment such as larger presses and scales.

3.9 CALTRANS REFERENCE SAMPLE PROGRAM (RSP) IN 2010

The *Independent Assurance Manual*, Section 2.4.4, "Proficiency Testing" states,

"The laboratory shall participate in all required proficiency sample programs to be accredited."

It is the laboratory's responsibility to maintain active status in proficiency testing of reference samples by testing and reporting the results.

Reference sample results are evaluated using a statistical evaluation system for determining the numerical ratings of each test method. The statistical evaluation method uses the standard deviation from the mean for a given test method as indicated below:

TABLE 6: RATING SYSTEM FOR THE REFERENCE SAMPLE PROGRAM

STATISTICAL VALUE	NUMERICAL RATING	INTERPRETATION OF RESULTS
$X \pm 1.0 \sigma$	5	Acceptable (Very Good)
$X \pm 1.5 \sigma$	4	Acceptable (Good)
$X \pm 2.0 \sigma$	3	Acceptable (Fair)
$X \pm 2.5 \sigma$	2	Unacceptable (Poor)
$X \pm 3.0 \sigma$	1	Unacceptable (Very Poor)

If a rating score less than 3.0 is received for any test method performed, the laboratory is required to examine its equipment and/or test procedures to determine why the test result varied appreciably from the mean of the test results obtained by other laboratories. A second sample of material will then be shipped to the laboratory for retesting.

If the results of the second test are acceptable and the causes leading to the original deficiency are corrected and documented, the initial unacceptable rating is considered resolved.

If the results of the second material sample are once again below a 3.0 rating, the individual laboratory must contact IA staff for assistance. A third sample may be run with district IA staff

witnessing the testing procedures. Unacceptable ratings, if uncorrected, will result in the loss of laboratory accreditation.

In 2010, samples of aggregate and asphalt concrete were distributed to participating laboratories.

Full reports for the 2010 Reference Sample Program are located in Appendix A.

3.9.1 GOALS FOR REFERENCE SAMPLE PROGRAM IN 2011

The following table gives an approximate timeline for the 2011 reference sample program:

2011	Sample Type
First quarter	Hot Mix Asphalt - CT 309
Second quarter	Fine Aggregate
Third quarter	Portland Cement Concrete

3.10 CALTRANS TEST METHOD UPDATES

To address the need for updating Caltrans Test Methods and to coordinate the changes in test methods resulting from the implementation of the new hot mix asphalt specification, three expert task groups (ETG) were formed. These technical working groups include members of industry and Caltrans. District IA staff are members of these technical working groups. The purpose of these groups is to update the current Caltrans test methods to reflect state of the art practices in the hot mix asphalt field.

The groups are as follows:

- Hot Mix Asphalt ETG (HMATG): deals with all test methods related to hot mix asphalt
- Aggregate ETG (ATG): deals with all test methods related to aggregate for hot mix asphalt
- Other: deals with test methods not in the other categories that relate to hot mix asphalt

Twenty three test methods were completed and posted on the Caltrans Test Method webpage in 2010. These task groups are expected to complete the remaining test method modifications in 2011.

3.11 LOCAL ASSISTANCE INDEPENDENT ASSURANCE PROGRAM

Chapter 16, Section 16.14, “Quality Assurance Program,” of the Caltrans Local Assistance Procedures Manual, states “**local agencies must follow Caltrans Quality Assurance Procedures (QAP) for all projects on the NHS**”. Therefore, for local agency projects on the NHS, Caltrans IA staff is responsible for providing IA services to local agencies.

Five positions were transferred between the Division of Local Agencies and the Division of Engineering Services in 2008 to assist DES in providing Caltrans IA services to local agencies for qualifying testers and accrediting laboratories. Local Assistance IA staff interacts on a regular basis with the district local assistance engineer (DLAE).

These five positions were filled in December 2008. Implementation of the Local Assistance IA program began in March 2009. In addition to providing IA services, the Local Assistance IA staff reviews local agency Quality Assurance Program (QAP) manuals for compliance with Caltrans Local Assistance requirements. In 2010, 67 local agency QAP manuals were reviewed by Local Assistance IA staff. QAP are required to be updated every five years.

4.0 CALTRANS INDEPENDENT ASSURANCE PROGRAM GOALS

4.1 INDEPENDENT ASSURANCE MANUAL REVISIONS

As a result of lessons learned from the implementation of the 2005 *Independent Assurance Manual*, changes are needed to the current manual. Revisions to the manual are planned for 2011.

4.2 QUALITY ASSURANCE PROGRAM FOR STRUCTURAL CONCRETE SAMPLING AND TESTING

The Department is developing a Quality Control/Quality Assurance (QC/QA) program for structural concrete sampling and testing. As part of this program, changes will be required to the 2005 *Independent Assurance Manual*, to reflect the new QC/QA program. Changes to the manual will be incorporated once the program is fully developed.

APPENDIX - A



REFERENCE SAMPLE PROGRAM
**RELATIVE COMPACTION OF
UNTREATED AND TREATED SOILS
AND AGGREGATE**
2010 PROFICIENCY TEST RESULTS

State of California Department of Transportation
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October 11, 2010

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REFERENCE SAMPLE PROGRAM RELATIVE COMPACTION OF UNTREATED AND TREATED SOILS AND AGGREGATES 2010 PROFICIENCY TEST RESULTS

1.0 OVERVIEW

The 2009 Relative Compaction proficiency test was started in September 2009. The proficiency test utilized California Tests (CT) 216 – “Relative Compaction of Untreated and Treated Soils and Aggregates”.

Approximately 50 pounds of Class II recycled aggregate base proficiency samples were sent to each participating laboratories. The goal of this test determines the proximity of results between Caltrans, Private, and Local Agency laboratories considering the subjective nature of this specific test. One hundred fifty-four (154) laboratories participated in the initial round of testing. Test results were received in January 2010 and analyzed in accordance with Caltrans Independent Assurance Program Manual. Laboratories that failed to achieve an acceptable score in the initial test were provided with an additional sample to conduct a retest. This report presents test results from both the initial test and the retest.

2.0 ANALYSIS OF TEST RESULTS

2.1 EVALUATION CRITERIA

Test results were analyzed using a statistical evaluation system in which the mean (X) and standard deviation (s) was calculated for each test parameter. A rating score was then given to the test result based on the criteria shown in Table 1. A test result with a score of 3 or greater was considered acceptable. A test result with a score of 2 or less was considered unacceptable and a retest was required.

Table 1: Evaluation Criteria

Test Result	Rating	Interpretation of Results	Acceptance
$X \pm 1.0s$	5	Very Good	Acceptable
$X \pm 1.5s$	4	Good	
$X \pm 2.0s$	3	Fair	
$X \pm 2.5s$	2	Poor	Unacceptable
$X \pm 3.0s$	1	Very Poor	

2.2 INITIAL TEST

A total of 154 laboratories participated in the initial test. An analysis for outliers in accordance with ASTM E 178 indicated that a test result from one of the laboratories was a possible outlier. This outlier is summarized in Table 2.

Table 2: Labs and Test Results Considered as Outliers

CT	# of Outlier	Lab ID
216	1	128

After removing the outlier, the mean value and standard deviation for each test parameter were re-calculated to determine the score for the respective test parameter. The analysis results are presented in Table 3. Detailed test results are provided in Appendix A.

Table 3: Summary of Initial Test Results

CT 216 – Relative Compaction of Untreated and Treated Soils and Aggregates								
Item	# Lab	Average	Standard Deviation	Number of Labs Achieved Score of				
				5	4	3	2	1
Relative Compaction, %	153	96.8	1.7	109	17	19	7	1
% of Total				71	11	12	5	1*

*Lab #128 was considered as an outlier and was not included in the initial analysis

2.3 RETEST

In the initial test, 9 laboratories did not receive an acceptable score. Samples for a retest were sent to these labs in February 2010. These laboratories were: 29, 31, 110, 128, 151, 174, 178, 234, and 297. Their results were included in the analysis of the retest results.

The outlier analysis was performed following ASTM E-178. It was determined that there were no outlier values on the retest results. The retest score for each laboratory was determined by comparing the retest result with the rating range from the initial test. Table 4 presents the mean value and standard deviation from the retest. Detailed test results and scores are provided in Appendix B.

Table 4: Summary of Retest Results

CT 216 - Relative Compaction of Untreated and Treated Soils and Aggregates								
Item	# Lab	Average	Standard Deviation	Number of Labs Achieved Score of				
				5	4	3	2	1
Relative Compaction, %	9	97	1.36	7	2	0	0	0
% of Total				78	22			

Lab No.	Results, %	Score
248	97	5
250	94	3
255	96	5
261	96	5
263	97	5
268	95	5
272	96	5
277	99	4
280	98	5
290	97	5
293	96	5
297	93	2
300	95	5
302	97	5
303	96	5
307	99	4
310	97	5
311	97	5
316	97	5
317	100	3
318	99	4
323	97	5
325	97	5
330	97	5
331	97	5
332	96	5
334	97	5
339	99	4
348	100	3
351	97	5
354	94	3
356	94	3
358	96	5
359	98	5
361	96	5
366	96	5
373	96	5
375	97	5
379	97	5
380	96	5
383	97	5
389	97	5
391	97	5
393	97	5
395	97	5
401	98	5

Lab No.	Results, %	Score
402	98	5
403	96	5
405	96	5
407	97	5
417	99	4
418	97	5
422	95	5
437	97	5
438	99	4
444	100	3
449	95	5
455	96	5
458	96	5
459	97	5
461	97	5
462	100	3
464	97	5
470	100	3
471	100	3
472	99	4
473	100	3
474	100	3
560	97	5
568	96	5
573	96	5
595	96	5
598	100	3
599	100	3
601	96	5
602	97	5

Legend:

1,2	Unacceptable Score
O	Outlier

2.4 COMBINED RESULTS

A total of 154 laboratories participated in the reference sample program. Nine laboratories participated in both the initial test and the retest. Table 5 shows combined scores from both the initial test and the retest. The final combined scores are provided in Appendix C.

Table 5: Summary of Combined Test Results

Test Method	Total # Labs	Number of Labs Achieved Score of				
		5	4	3	2	1
CT 216	154	116	19	19	0	0
	% of Total	75	12.5	12.5		

2.5 OBSERVATIONS

There were nine laboratories that failed in the initial test. A retest was conducted by these laboratories and achieved acceptable results. No further failures were observed. Possible cause of the initial failure maybe attributed to the following:

- Equipment out of calibration – it was noticed that some tamper weights were over the allowable tolerance.
- Not following proper test procedure/s or best practice, i.e., inaccurate tamper graduation reading, inaccurate moisture computation, inconsistent tamper drop height.

3.0 SUMMARY

CT 216 – In the initial round of testing, 154 laboratories participated, 9 of which did not achieve an acceptable score. The 9 laboratories with poor scores were given additional sample to conduct a retest. After the retest was completed, all 9 laboratories submitted satisfactory results and was able to gain acceptable scores.

4.0 REFERENCES

ASTM, “Standard Practice for Dealing with Outlying Observations,” Designation E 178 – 80.

Caltrans, “Independent Assurance Manual,” Sacramento, July 2005.

Test Results from Initial Test

Lab No.	Results, %	Score
9	96	5
12	96	5
15	97	5
17	100	3
18	97	5
19	97	5
20	99	4
21	97	5
22	97	5
23	95	5
24	99	4
26	96	5
27	96	5
29	93	2
31	93	2
42	95	5
48	96	5
49	97	5
53	96	5
56	96	5
57	96	5
64	99	4
65	96	5
66	95	5
67	96	5
70	96	5
76	99	4
79	97	5
80	96	5
84	95	5
87	97	5
88	97	5
89	97	5
91	97	5
92	96	5
95	94	3
96	94	3
101	96	5
102	97	5

Lab No.	Results, %	Score
104	95	5
110	93	2
114	100	3
125	94	3
126	99	4
127	96	5
128	90	0
131	95	5
133	96	5
137	97	5
139	98	5
145	96	5
146	97	5
149	98	5
151	93	2
158	97	5
165	96	5
166	96	5
174	93	2
177	99	4
178	102	1
182	99	4
196	97	5
200	97	5
201	99	4
204	96	5
206	96	5
207	96	5
210	96	5
211	99	4
216	96	5
223	96	5
225	96	5
226	96	5
233	96	5
234	93	2
237	100	3
239	97	5
244	99	4

Test Results from Initial Test

Lab No.	Results, %	Score
29	97	5
31	97	5
110	97	5
128	96	5
151	96	5
174	95	5
178	99	4
234	99	4
297	96	5

Combined Final Scores from both Initial Test and Retest

Lab No.	Results, %	Score
9	96	5
12	96	5
15	97	5
17	100	3
18	97	5
19	97	5
20	99	4
21	97	5
22	97	5
23	95	5
24	99	4
26	96	5
27	96	5
29	97	5
31	97	5
42	95	5
48	96	5
49	97	5
53	96	5
56	96	5
57	96	5
64	99	4
65	96	5
66	95	5
67	96	5
70	96	5
76	99	4
79	97	5
80	96	5
84	95	5
87	97	5
88	97	5
89	97	5
91	97	5
92	96	5
95	94	3
96	94	3
101	96	5
102	97	5
104	95	5
110	97	5

Lab No.	Results, %	Score
114	100	3
125	94	3
126	99	4
127	96	5
128	96	5
131	95	5
133	96	5
137	97	5
139	98	5
145	96	5
146	97	5
149	98	5
151	96	5
158	97	5
165	96	5
166	96	5
174	95	5
177	99	4
178	99	4
182	99	4
196	97	5
200	97	5
201	99	4
204	96	5
206	96	5
207	96	5
210	96	5
211	99	4
216	96	5
223	96	5
225	96	5
226	96	5
233	96	5
234	99	4
237	100	3
239	97	5
244	99	4
248	97	5
250	94	3
255	96	5
261	96	5